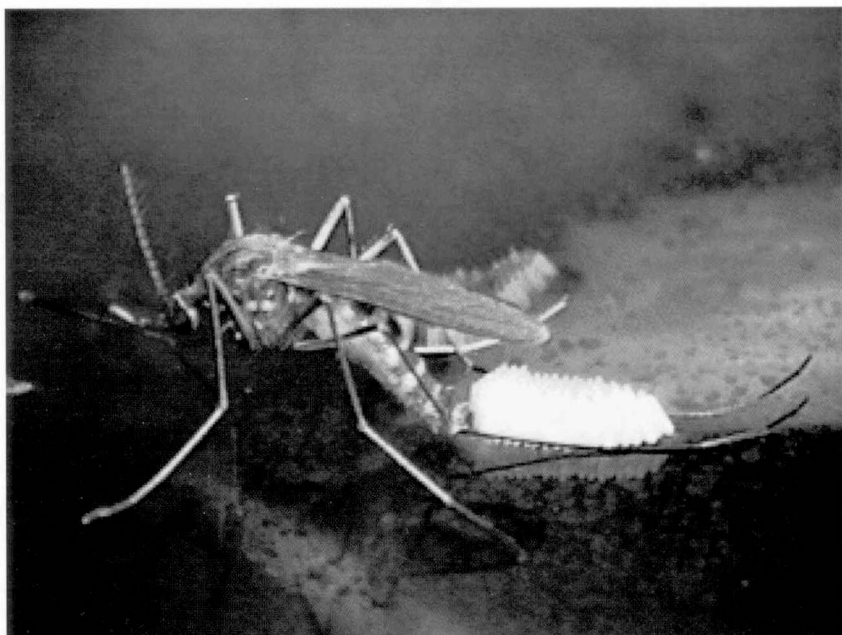


# West Nile Virus Infection

## Prevention and Control

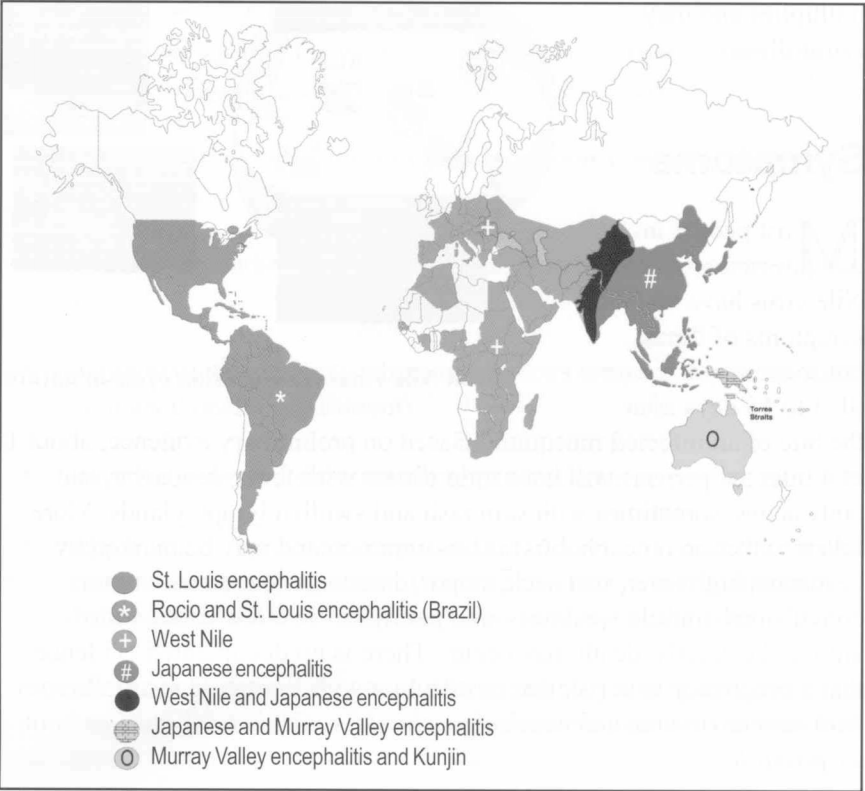


*Culex* mosquito laying eggs.



# West Nile Virus Encephalitis

Viruses and bacteria can cause encephalitis (an inflammation of the brain) in humans and other animals. West Nile encephalitis is an infection of the brain caused by West Nile virus, a close relative of St. Louis encephalitis virus. West Nile virus is commonly found in Africa, West and Central Asia, and the Middle East (see map). In 1999 and 2000, it caused an outbreak of human encephalitis in and around New York City. It is not known how West Nile virus was introduced to the United States.

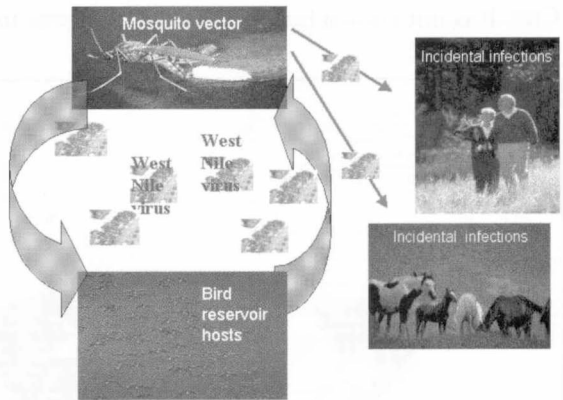


**The geographic distribution of the Japanese encephalitis serocomplex of the family Flaviviridae, viruses that are related to West Nile virus**

People get West Nile encephalitis from the bite of a mosquito that is infected with West Nile virus. West Nile virus is NOT transmitted from person to person. For example, you cannot get West Nile virus from touching or kissing a person who has the disease or from a health care worker who has treated someone with the disease.

## Natural Transmission

Mosquitoes become infected with West Nile virus when they feed on infected birds that carry the virus in their blood. After 10 to 14 days, the mosquito's salivary glands become infected and those infected mosquitoes can then transmit West Nile virus to humans and other animals while biting them to take blood. During blood feeding, the mosquito injects the virus into the animal or human, where it multiplies and may cause illness.



West Nile virus transmission cycle in nature

## Symptoms

Most people infected with West Nile virus have no symptoms of illness, but some may become ill 3 to 15 days after the bite of an infected mosquito. Based on preliminary evidence, about 1 in 4 infected persons will have mild illness with fever, headache, and body aches, sometimes with skin rash and swollen lymph glands. More severe infection (encephalitis) is less common and may be marked by headache, high fever, stiff neck, stupor, disorientation, coma, tremors, convulsions, muscle weakness, and paralysis. In a few cases, mostly among the elderly, death may occur. There is no documented evidence that a pregnancy is at risk due to infection with West Nile virus. *Persons with severe or unusual headaches should seek medical care as soon as possible.*

## Risk

The risk of getting West Nile encephalitis is limited to persons in areas where virus activity occurs and is higher in persons 50 years of age and older. A 1999 survey of residents in the most affected area of New York City showed that about 2.6% of residents had been infected with West Nile virus but either were not clinically ill or had only a mild illness. Of the 62 persons with the most severe illness during the 1999 New York City outbreak, 11% died.

## Treatment

There is no specific therapy for West Nile encephalitis. In more severe cases, intensive supportive therapy is indicated: hospitalization, intravenous (IV) fluids, airway management, respiratory support (ventilator) if needed, prevention of secondary infections (pneumonia, urinary tract, etc.), and good nursing care.

## How To Prevent Infection

There is no vaccine for West Nile encephalitis. However, you can reduce the risk of becoming infected in these ways:

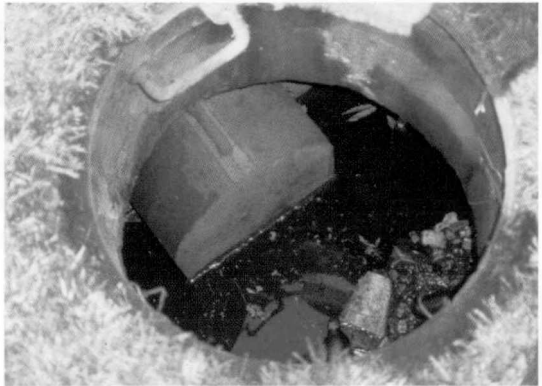
- Report dead or dying birds to your city, county, or state health department.
- Alert health authorities to potential mosquito breeding sites in your area.
- Avoid activities in areas where mosquitoes are present (check with your local health department).
- Wear long-sleeved shirts and long pants whenever you are outdoors.
- Apply insect repellent to exposed skin. An effective repellent will contain the active ingredient DEET (N,N-diethyl-m-toluamide).\* Follow the manufacturer's **DIRECTIONS FOR USE** on the label.
- Avoid applying repellent to children under 2 years of age, and to the hands of older children because repellents may irritate the eyes and mouth.
- Spray clothing with repellents containing permethrin or DEET, because mosquitoes may bite through thin clothing. Whenever you use an insecticide or insect repellent, be sure to read and follow the

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\*Fradin, MS. Mosquitoes and mosquito repellents: A clinician's guide. *Annals of Internal Medicine* 1998;128:931-940.

manufacturer's  
**DIRECTIONS FOR USE**,  
as printed on the  
product. (*Note:*  
Vitamin B and  
“ultrasonic” devices  
are NOT effective in  
preventing mosquito  
bites.)

- Drain standing water  
in your yard. Empty  
water from mosquito  
breeding sites, such  
as flower pots, pet bowls, clogged rain gutters, swimming pool covers, discarded tires, buckets, barrels, cans, and similar items in which mosquitoes can lay eggs.
- Maintain window and door screening to keep mosquitoes out of buildings.



**Storm sewer catch basins can be mosquito breeding sites.**

DEET-containing repellents are registered with the Environmental Protection Agency. See the EPA Web site at <http://www.epa.gov/pesticides/>

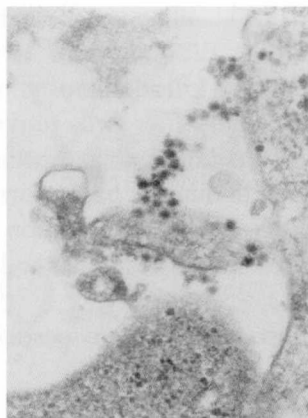
For medical information regarding DEET, contact the National Pesticide Telecommunications Network (NPTN) at 800-858-7378 (6:30 a.m. to 4:30 p.m. Pacific Time, 7 days/week, except holidays) or visit their Web site at <http://ace.orst.edu/info/nptn/>



**Swimming pools containing green algae and other organic matter are favored breeding sites of mosquitoes.**

## Surveillance

**F**ederal, state, and local governments, and other organizations are conducting surveillance for West Nile virus infections among bird, mosquito, horse, and human populations. Enhanced surveillance is a priority in those states already affected or having a potential for being affected, including areas along the Atlantic and Gulf coasts. However, other states are also monitoring this virus.



**Electron micrograph of West Nile virus particles (cluster of dark spheres)**

## Dead Birds

**I**n 1999 a connection was made between an outbreak of human West Nile virus infection and disease in birds, especially in American crows in the New York City area. Therefore, sick or dying birds should be reported to the local, city, or county health department. Avoid bare-handed contact with dead birds and other animals; use gloves or double plastic bags to place the carcass in a garbage can. Consult your local health department for submission instructions for testing.



## Prevention and Control

The public health implications of the introduction of this new virus are serious. To prevent and control West Nile virus infection and other mosquito-borne diseases, the public health system must be fully equipped to conduct active surveillance, identify bird and other hosts that act as reservoirs, monitor human illness, and carry out mosquito control activities.

Many chemicals approved by the Environmental Protection Agency (EPA), called "larvicides," kill immature mosquitoes and can be applied

to the standing water where mosquitoes breed. EPA-approved “adulticides” (products that kill adult mosquitoes) should be used only after virus activity has been detected in an area, especially if transmission to humans has occurred. See the Environmental Protection Agency (EPA) Web site on Pesticides and Mosquito Control at <http://www.epa.gov/pesticides/>



**Abandoned tires can be mosquito breeding sites.**

## **For More Information**

### **National Contact:**

Division of Vector-Borne Infectious Diseases  
National Center for Infectious Diseases  
Centers for Disease Control and Prevention (CDC)  
P.O. Box 2087  
Fort Collins, CO 80522  
Fax: 970-221-6476  
E-mail: [dvbid@cdc.gov](mailto:dvbid@cdc.gov)  
Web site: <http://www.cdc.gov/ncidod/dvbid/dvbid.htm>  
CDC Voice and Fax Information Service: 1-888-232-3228

### **Local Contact:**